Combination effect of core stability exercise and contract relax exercise on hamstring flexibility

by Dwikora Utomo

Submission date: 07-Feb-2019 03:04PM (UTC+0800)
Submission ID: 1074374349
File name: -_Jurnal_Combination_effect_of_core_stability_exercise_and.pdf (504.52K)
Word count: 2327
Character count: 12298

Combination effect of core stability exercise and contract relax exercise on hamstring flexibility

A L Na'ima[1,4*], G M Sari[2] and D N Utomo[3]

[1]Sport Health Science Study Program, Universitas Airlangga, Surabaya
[2]Physiology Department, Universitas Airlangga, Surabaya
[3]Department of Orthopedics and Traumatology, Dr. Soetomo Hospital, Surabaya

*Coresponding author : aisyahlifsantin@gmail.com

Abstract. Hamstring is a muscle group that often has a reduced flexibility compared to other muscle groups. This hamstring flexibility reduction can lead as a low back pain risk factor. Nowadays, the combination effect of core stability and contract relax exercise on hamstring flexibility is still unclear. The aim of this research was to know about this exercise on hamstring flexibility. This research is experimental with 24 subjects of healthy female students who participated in the exercise program for 4 weeks consisting of 3 times per week. Subjects were randomly assigned to one of three groups: (1) core stability-CS (n=8) (2) core relax-CR(n=8), (3) core stability combined contract relax-CS+CR(n=8). The hamstring flexibility was assessed with sit and reach test using the sit and reaches box. The examinations were conducted by observers twice, prior the training program and 2 days after the last session of exercise. 22 subjects were analyzed (CS,n=7;CR,n=8;CS+CR,n=7). The paired t test analysis of each group showed significant CS (p=0.03), CR (p=0.00), CS+CR (p=0.01) in increasing of result sit and reach test was observed. There was a difference between the three groups by the ANOVA test (p=0.00). This study shows that combination of core stability and contract relax exercises can increase hamstring flexibility.

1. Introduction

Lack of physical activity is the biggest cause of reduced flexibility [1]. Flexibility is the ability to move a single joint or series of joints smoothly and easily through an unrestricted pain-free ROM [2]. Hamstring is a muscle that generally experiences adaptive shortening compared to other muscle groups. Hamstring consists of 3 hamstrings and the movements include hip extension and knee flexion [3]. Reduced flexibility of hamstring can cause risk factors for low back pain [4].

Various stretching technique are used in clinical practice to increase hamstring flexibility [5-6]. Core stability exercise is an exercise that activates deep core muscles [7]. While contract relax exercise is a stretching exercise technique of the Proposeptive Neuromuscular Fascilitation (PNF) method which uses isometric muscle contraction followed by muscle relaxation [5]. Motram and Comerford [8] and Sahrman [9] stated that the combination of static stretching and exercise stabilization efficiently in form of the correct muscle activity patterns. Contract relax stretching according to Morceli [10] stated that it is better than static stretching in increasing hamstring flexibility. Therefore, the aim of this study was to know the combination effect of core stability exercise and contract relax exercise on hamstring flexibility.

2. Materials and Method

2.1. Type and design of research

This research is a experimental research with three groups of randomized pretest and posttest group design. Ethical feasibility test has been carried out for this research by the Ethics Committee of the Health Research Faculty of Medicine, Universitas Airlangga Surabaya with the number of ethical feasibility certificate 165 / EC / KEPK / FKUA / 2018.

2.2. Research subject

Subjects who was participated in this research is 24 healthy subjects female physiotherapy students of Health Sciences Institute Bhakti Wiyata Kediri who met the following recruitment criteria: age 20-25 years, normal body mass index according to the Asia Pacific (18.5 to 22.9 kg / m2), no injuries to the lower extremities or lower back pain within 1 year last previous requiring a requirements for medical treatment. Subjects who had involved in active exercise and taking muscle relaxant drugs were not included as research subjects. Subjects who did not participate in all three exercise sessions or not replace the missed exercise excluded from the analysis (drop-outs).

2.3. Exercise program

Each group underwent a 4-week exercise program, consisting of 3 times per week. Each session started with warming up for 5 minutes, and continued with 5 mintes for exercise.

2.3.1. Core stability exercise

The program of core stability was conducted with two exercise were performed. The first, pelvic tilting exercises. Where the subject is lying on his back, knees bent and feet placed on the floor. The hand is beside the body. Subjects were instructed to tighten the abdominal muscles by pulling the stomach inward. The second exercise, supine bridging exercise was performed in a supine position with the hand is beside the body. Subjects were instructed to raise the hips upwards, so that the body was in a straight line from the knees, hips to shoulders then subjects were asked to tighten the hips. This position activated isometric contraction was contraction for 3 seconds, 3 seconds of relaxation. The exercise was repeated 10 times.

2.3.2. Contract relax exercise

This program were performed with subject lying on his back with both legs straight. Then the subject was instructed to lift 1 leg to the limit of the maximum hip flexion with the knee joint held straight. Subjects were instructed to perform isometric contractions which were against resistance in the elastic band drawn by the arm of the subject. The exercise was repeated 4 times /lower extremity with contraction for 5 second and 10 seconds of relaxation.

2.3.3 Combined core stability and contract relax exercise

In this group core stability exercises were given first then contract relax exercise with a dose of exercise repetition ½ of core stability exercise and contract relax exercise.

2.4. Hamstring flexibility protocol

The flexibility of the hamstring muscle is measured by the sit and reach test using a sit and reach box of 30" x 4" x 13" in units of centimeters or inches. The examinations were conducted by observers twice, prior the training program and 2 days after the last session of exercise. The sit and reach test was carried out with the subjects sitting on the floor by straightening their knees and soles of the feet. The soles of the feet must be attached to the side of the sit and reach box. The subject is then instructed to keep the knee straight, then the arm reaches with the hand parallel to the palm overlapping as it slowly reaches forward as far as possible along the top of the box. Ask the subject to hold for 2 seconds. Aim the top of the box at the subject's fingertips. Subjects were given 2 trials and the recorded value was the best value [1].

3. Results and Discussion

3.1. Subjects characteristics

Table 1. Parameters of three groups at an initial examination after excluding data

Variable	CS n=7	CR n=8	CS+CR n=7	P level
	Mean ± SD	Mean ± SD	Mean ± SD	
Age (Years)	21,25 ± 1,16	21,50 ± 1,19	21,13 ± 1,12	0,91
Weight (Kg)	47,12 ± 3,90	44,31 ± 3,80	49,56 ± 5,05	0,57
BMI (Kg/m^2)	19,86 ± 1,36	19,70 ± 1,53	20,74 ± 1,53	0,41
Hamstring flexibility (cm)	22,71 ± 4,53	19,25 ± 4,46	20,14 ± 3,38	0,92

CS : core stability exercise

CR : contract relax exercise

CS+CR : combined core stability and contract relax exercise

Before the exercise program there were no differences between the CS, CR, CS+CR groups regarding age, weight, BMI, and hamstring flexibility.

3.2 Alteration hamstring flexibility before and after exercise

Table 2. Alteration hamstring flexibility before and after exercise program

	n	Pretest	Posttest	P level
		Mean ± SD	Mean ± SD	
CS	7	22.71 ± 4.53	25.28 ± 3.77	0.032
CR	8	19.25 ± 4.46	27.00 ± 1.92	0.001
CS+CR	7	20.14 ± 3.38	27.85 ± 2.03	0.018

CS : core stability exercise

CR : contract relax exercise

CS+CR : combined core stability and contract relax exercise

$p < 0.05$

The result obtained in this research indicate that after a 4-week exercise program increases hamstring flexibility. Although the results show that the biggest increase occurred in the CR exercise group. In contract relax exercise the reciprocal inhibition [11]. Mechanism occurs when muscle spindle releases nerve impulses, which stimulates afferent nerve fibers from the agonist muscle (quadriceps), then nerve impulses synapse with excitatory motor neurons of the agonist muscle (quadriceps) in the spinal cord and at the same time inhibits the motor neuron of the antagonistic muscle (hamstring) which prevents it from contracting [12] so that the hamstring length increases.

Lack of studies on core stability exercise about hamstring flexibility. This phenomenon is based on the anatomy of the hasmtring which has a torso of biceps femoris attached to the ischial tuberosity which is an extension of the sacrotuberous ligament whose position is crossed on the os. sacrum and attached to the thoracolumbar fascia. Through this relationship can affect tight hamstring and reduce the anterior pelvic tilt [13]. Pelvic tilting and supine bridging is an isometric activation exercise for core stabilization and activation of the gluteus maximus muscle and facilitating hip extension muscles [14] indirectly muscle lengthening in the hamstring muscle but through pelvic motion [15].

Core stability and contract relax combination exercises in this study show that this exercise also increases hamstring flexibility. This is because if core stabilization of activated and combined with stretching, a greater stretch is obtained [16].

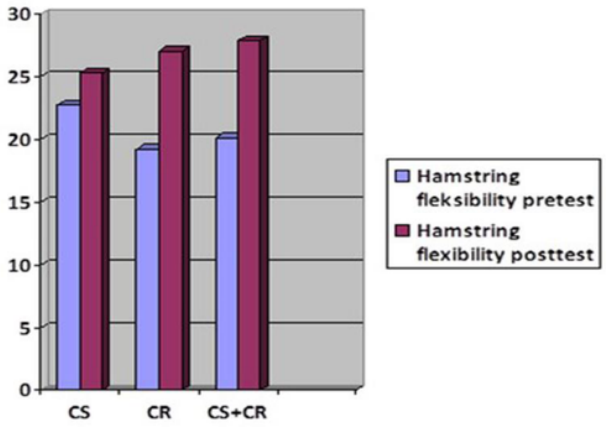

Figure 1. Bar chart hamstring flexibility. The hamstring flexibility pretest and posttest were significant increase in all exercise group CS (p = 0.032), CR (p = 0.001), and CS+CR (p = 0.018).

3.3 Differences hamstring flexibility in three group between posttest and pretest

Table 3. Differences hamstring flexibility in three group between posttest and pretest

	CS	CR	CS+cR	P level
	Mean ± SD	Mean ± SD	Mean ± SD	
Hamstring flexibility (cm)	2.57 ± 2.43	7.75 ± 4.30	7.71 ± 2.21	0.008

CS : core stability exercise

CR : contract relax exercise

CS+CR : combined core stability and contract relax exercise

$p < 0.05$

The biggest increase in the hamstring flexibility was observed in the CR exercise group (7.75 ± 4.30) and there were significant differences between all three group (p = 0.008).

5. Conclusions

This study can be concluded that the three groups core stability exercise, contract relax exercise and combination of both core stability and contract relax exercises can increase hamstring flexibility in students, as well as combination of both core stability and contract relax exercise better than core stability exercises only and as good as contract relax exercises in increasing hamstring flexibility in students.

Acknowledgments

Author wishes to acknowledgments to Health Science Institute Bhakti Wiyata Kediri for giving permission to conduct research there.

Refferences

[1] V H Heyward and A L Gibson 2014 Advanced Fitness Assessment and Exercise Prescription; Flexibility Assessment and Prescription (United States : Human Kinetics)

[2] C Kisner and Colby L A 2007 *Therapeutic Exercise*. Ed. 5th (Philadelphia: F.A Davis Company)
[3] M Ramesh and P Sivasankar 2014 Comparison of Three Different Physiotherapeutic Interventions in Improving Hamstring Flexibility in Individuals with Hamstring Tightness *Int J. of Health Science and Research* **4** 129-34
[4] Reis F J, Adriana and Macedo R 2015 Influence of Hamstring Tightness In Pelvic, Lumbar and Trunk Range Of Motion In Low Back Pain And Asymptomatic Volunteers During Forward Bending *Asian Spine J.* **9** 535-40
[5] Magalhaes *et al* 2015 Comparison of The Effects of Hamstring Stretching Using Proprioceptive Neuromuscular Facilitation With Prior Application of Cryotherapy or Ultrasound Therapy *J. Physical Therapy Science* **27** 1549-53
[6] P Page 2012 Current Concepts In Muscle Stretching For Exercise And Rehabilitation *Int J. of Sport Physical Therapy* **7** 109-19
[7] M Stephen and R Johnson 2008 Stabilization Exercise For Low Back Pain: A Systematic Review *J. Physiotherapy* **94** 179-89
[8] Mottram S L and Comerford M J 2006 Management strategies-exercise therapy. In: Hutson J, Ellis R, Textbook of Musculoskeletal Medicine (UK: Oxford University Press)
[9] Sahrmann S A and Bloom N 2011 Update of concepts underlying movement system syndromes (St. Louis: Elsevier Mosby)
[10] Morcelli *et al* 2013 Comparison of Static, Ballistic and Contract-Relax Stretching in Hamstring Muscle *Fisioter.Pesqui* **20** 244-49
[11] Sonal, A 2016 Comparison Between Post Isometric Relaxation and Reciprocal Inhibition Manuevers on Hamstring Flexibility In Young Healthy Adults: Randomized Clinical Trial *Int J Med Research Health Science* **5** 33-37
[12] Leon, C 2001 Muscle Energy Technique (Philadelpia: Churchill Livingstone)
[13] Van W J P, Vleeming A, Snijders C J & Stoeckart R 1993 A functional-anatomical approach to the spine-pelvis mechanism: Interaction between the biceps femoris muscle and the sacrotuberous ligament *European Spine J* **2** 140–44
[14] Hasebe K 2013 Spino Pelvic Rhythm With Forward Trunk Bending In Normal Subjects Without Low Back Pain. Europe J Ortho Surgery Traumatology. DOI 10.1007/s00590-013-1303-1. Spinger
[15] Wagner T *et al* 2010 Strengthening and Neuromuscular Reeducation of The Gluteus Maximus in a Triathlete With Exercise-Associated Cramping of The Hamstring *Journal Orthop Sports Phys Ther* **40** 112-19
[16] D Czaprowski *et al* 2013 The Comparison of The Effects of Three Physiotherapy Techniques on Hamstring Flexibility in Children: A Prospective, Randomized, Single-Blind Study. PLOS ONE. **8/** e72026

Combination effect of core stability exercise and contract relax exercise on hamstring flexibility

ORIGINALITY REPORT

19%	19%	11%	0%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	iopscience.iop.org Internet Source	2%
2	doaj.org Internet Source	2%
3	www.ijmrhs.com Internet Source	2%
4	www.dianelee.ca Internet Source	1%
5	www.jptrs.org Internet Source	1%
6	repository.unair.ac.id Internet Source	1%
7	www.omicsonline.org Internet Source	1%
8	innovareacademics.in Internet Source	1%
9	Brad Schoenfeld. "Do Single-Joint Exercises	

	Enhance Functional Fitness? :", STRENGTH AND CONDITIONING JOURNAL, 02/2012 Publication	1%
10	www.iqfuse.com Internet Source	1%
11	www.science.gov Internet Source	1%
12	ojs.ukw.edu.pl Internet Source	1%
13	wlv.openrepository.com Internet Source	1%
14	unitec.researchbank.ac.nz Internet Source	1%
15	edoc.site Internet Source	1%
16	academic.oup.com Internet Source	1%
17	www.rcuv.org Internet Source	1%
18	www.theseus.fi Internet Source	<1%
19	www.mandevillechiropractic.com Internet Source	<1%
	pertambangan.fst.uinjkt.ac.id	

20	Internet Source	<1%
21	dune.une.edu Internet Source	<1%
22	C. Shanthi, B. Kamaraju, I. Srikanth. "Study to Compare the Effectiveness of Static Stretch and Hold Relax Technique over Hamstring Flexibility", International Journal of Physiotherapy, 2014 Publication	<1%

Exclude quotes	On	Exclude matches	Off
Exclude bibliography	On		

Combination effect of core stability exercise and contract relax exercise on hamstring flexibility

GRADEMARK REPORT

FINAL GRADE

/100

GENERAL COMMENTS

Instructor

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5